2006 Status Report on the Accomplishments of the Mussel Coordination Team (MCT)

September, 2007

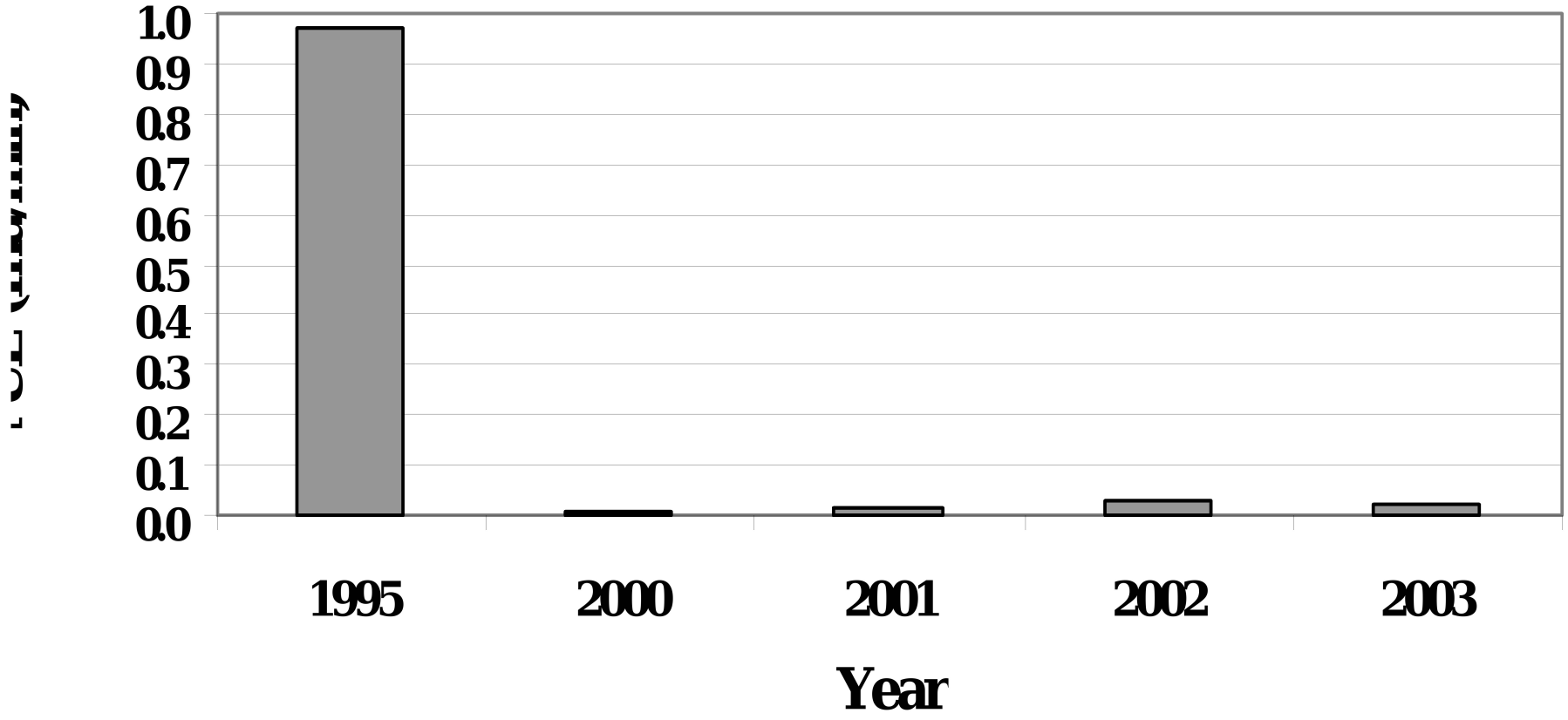
Zebra Mussels

Driessena polymorpha

A Classic Exotic Story….

Federally Endangered Higgins eye pearlymussel

Lampsilis higginsii at East Channel



FWS Biological Opinion for the 9-Foot Channel Project

April, 2000 = Jeopardy

- **Reasonable & Prudent Measures to Avoid Jeopardy:**
  - Establish viable populations of Higgins eye in areas not infested with zebra mussels
  - Control upstream transport of zebra mussels

Mussel Coordination Team

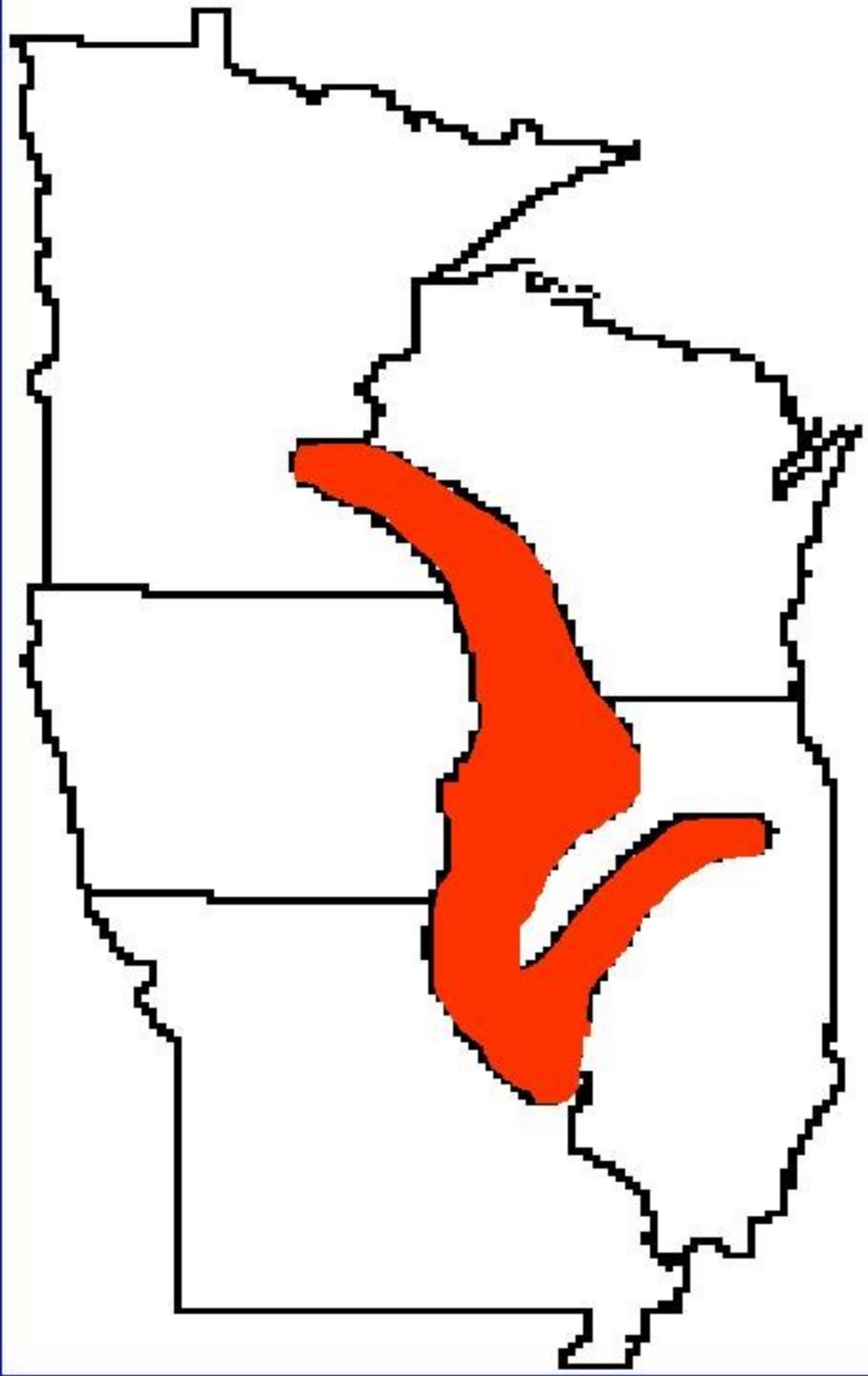
- Assist Corps of Engineers in implementing Biological Opinion requirements

- **Partners:**
  - Wisconsin, Minnesota, Iowa, Missouri & Illinois Departments of Natural Resources
  - U.S. Geological Survey
  - Corps of Engineers
  - U.S. Coast Guard
  - Fish & Wildlife Service
  - National Park Service
  - Science Museum of Minnesota
  - University of Minnesota, Iowa State University

Higgins Eye Pearlymussel Conservation Plan

- **Interim Goal** (next 10 years or so) -- Maintain/establish viable *Lh* populations

  - **Establish minimum of 5 new and viable populations in areas not infested with zebra mussels**



Higgins Eye Pearlymussel

Historic Range

Unfortunately, zebra mussels have been found nearly everywhere in the Upper Mississippi River and lower portions of tributaries.

Establish 5 New Populations

1. Select 10 Experimental Sites

Ten Population Establishment Sites for Higgins eye

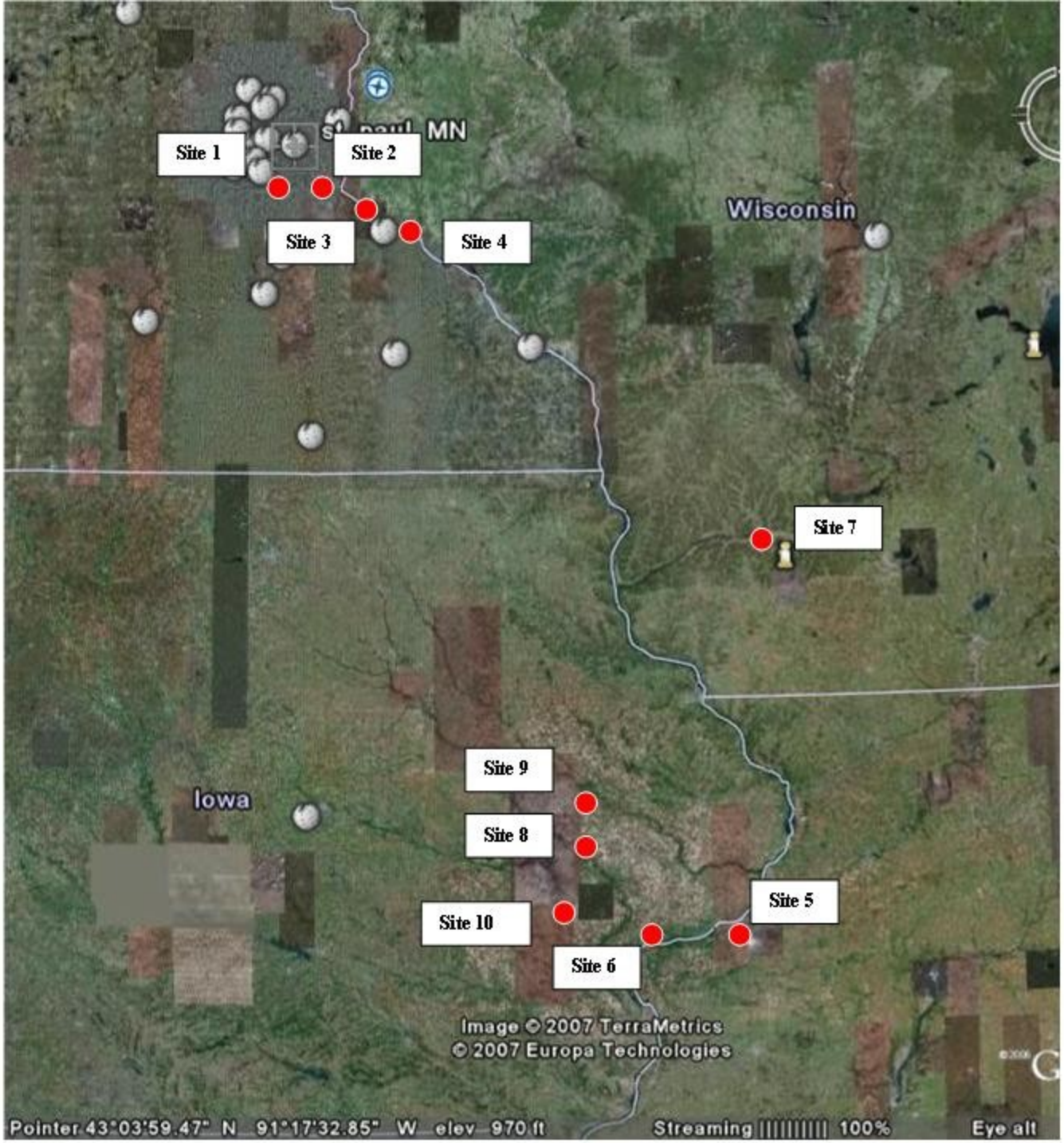
UMR Twin Cities, MN

Wisconsin River, WI

Cedar River, IA
Iowa River, IA
Wapsipinicon River, IA

Rock River, IL

UMR Pool 16 ,Fairport IA

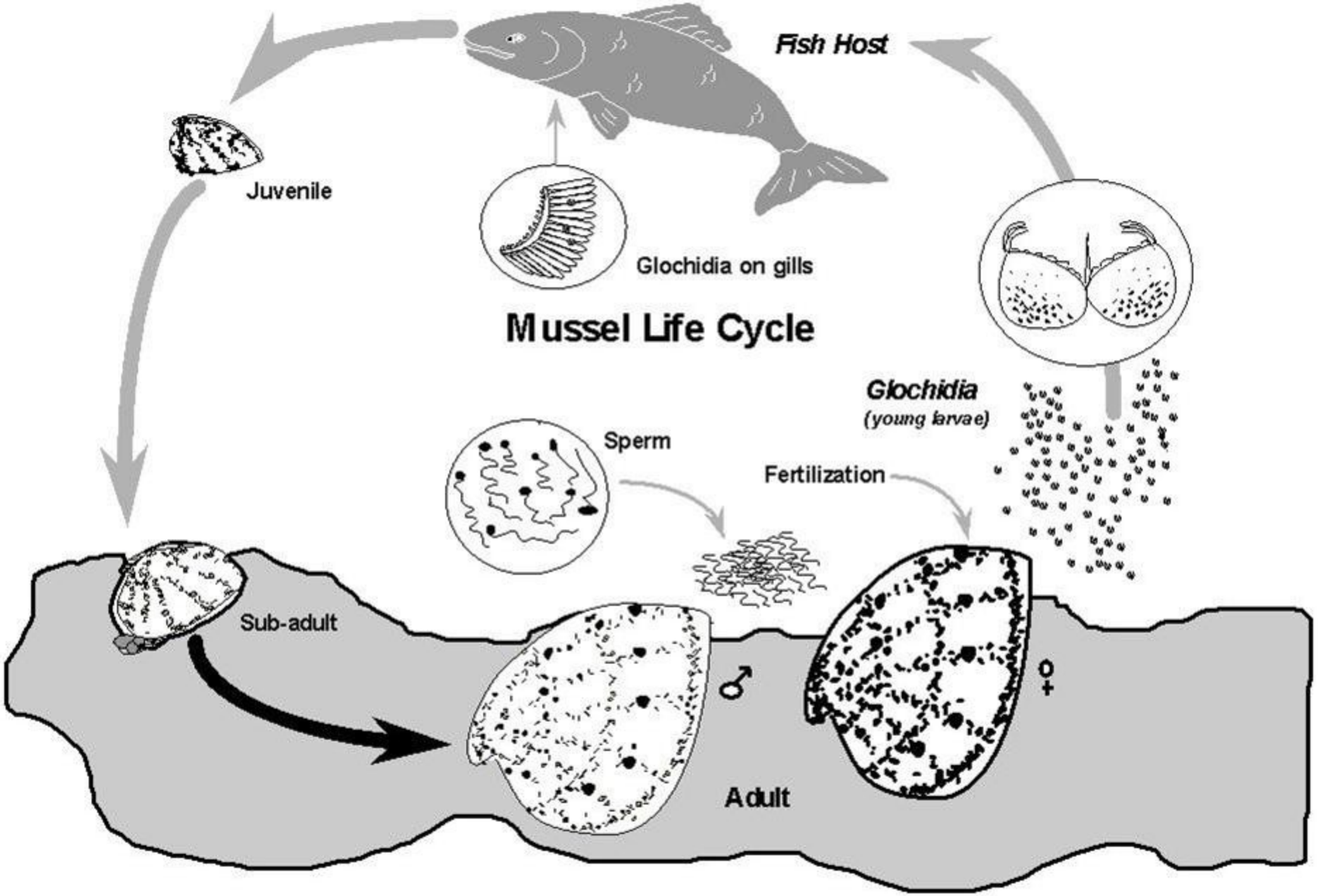


Establish 5 New Populations

1. **Select 10 Experimental Sites**

2. **Methods**

- Stock Juvenile Mussels (<1 yr old)
- Stock Sub-adult Mussels
- Stock Adult Mussels
- Combination of Above


Fish Host
Juvenile
Glochidia on gills
Mussel Life Cycle
Glochidia
(young larvae)
Sperm
Fertilization
Sub-adult
♂
♀
Adult

Chris Barnhart, SMSU

Lures to entice host fish species “Free Lunch”

Lampsilis reeveiana

Chris Barnhart, SMSU

Higgins eye

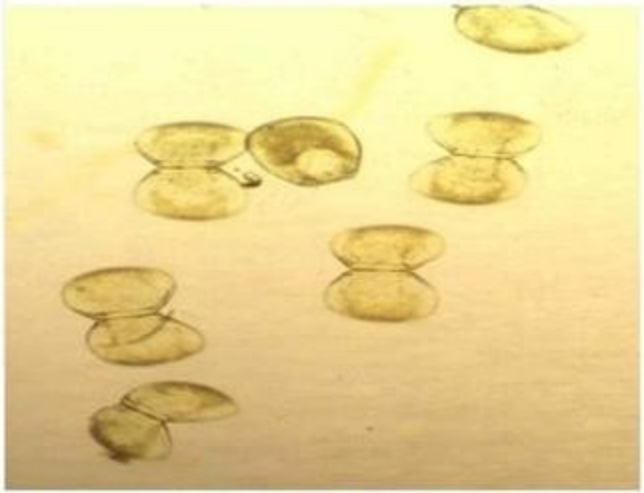
Lampsilis higginsii

Host fish infestation at Genoa National Fish Hatchery, WI

343 female Higgs (3 strains)

39,387 host fish (walleye, smallmouth bass, largemouth bass)

5,918,276 potential juveniles



1. Stocking Juveniles

Methods

- 1. Release Hatchery Juveniles into River
  - Approx. 8,000 stocked with no recovery = discontinued method

1. Stocking Juveniles

Methods

- 2. Release Glochidia-Inoculated Host Fish (hatchery or wild) directly into River

- 21,429 stocked at four sites….10 juveniles collected in Wapsipinicon River (IA) and 4 in Wisconsin River (WI)

1. Stocking Juveniles

Methods

- 3. Place Glochidia-Inoculated Host Fish in "Open" Cages in the River

- 2,802 fish placed in 78 open cages…
4 juveniles collected in Wisconsin River WI
(combination fish release & cage site)

Open Cages = transformers fall through wire mesh

In 2005, Higgins eye in Wapsi River
From 2001 year class- Genetically
Confirmed by Iowa State University

Hamilton Bell Co., Inc.
MONTVALE, N.J. 07645

1590
Wi. R., Orion juvenile L. higginsi

2. Stocking Sub-adults

Methods

- 1. Grow Juveniles in “Closed” Cages Until Age 2 or 3 and Release into River

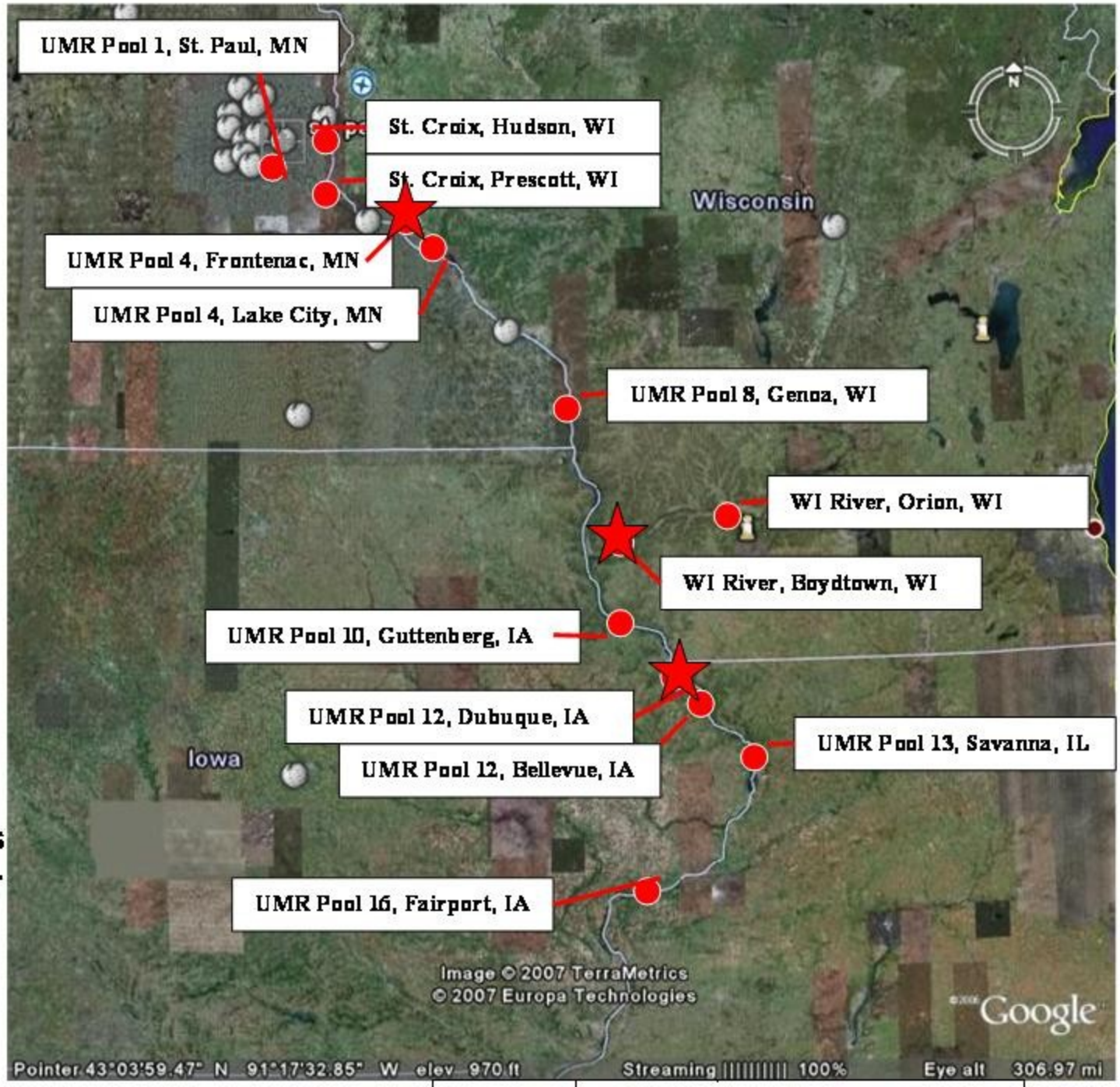
Higgins eye

14 Closed cage propagation sites

491 cages

17,753 host fish

Frontenac was best site = in 2006 we had 35,823 subadults held in cages for stocking


UMR Pool 1, St. Paul, MN
St. Croix, Hudson, WI
St. Croix, Prescott, WI
Wisconsin
UMR Pool 4, Frontenac, MN
UMR Pool 4, Lake City, MN
UMR Pool 8, Genoa, WI
WI River, Orion, WI
WI River, Boydtown, WI
UMR Pool 10, Guttenberg, IA
UMR Pool 12, Dubuque, IA
UMR Pool 13, Savanna, IL
Iowa
UMR Pool 12, Bellevue, IA
UMR Pool 16, Fairport, IA
Image © 2007 TerraMetrics
© 2007 Europa Technologies
Google
Pointer 43°03'59.47" N 91°17'32.85" W elev 970 ft
Streaming 100%
Eye alt 306.97 mi

Higgins eye

Cage propagation at Frontenac, MN

Pool 4, Upper Miss. River

Floating cage propagation system used in the Ice Harbor at Dubuque, IA

Pool 12, Upper Miss. River

Collecting Higgins eye from propagation cages in the Upper Miss. River

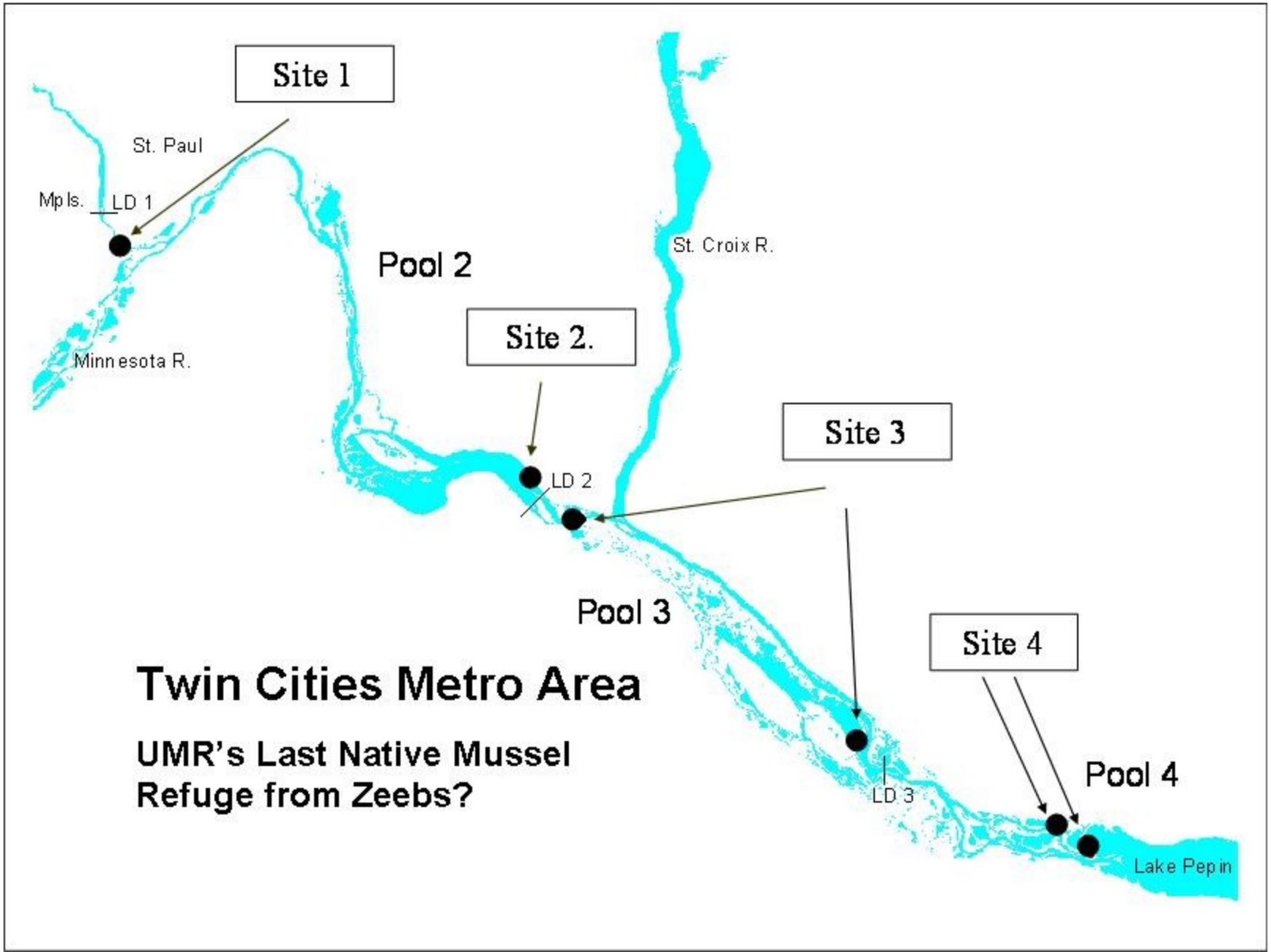
* Record number of juveniles per cage was 1,400 in 2005

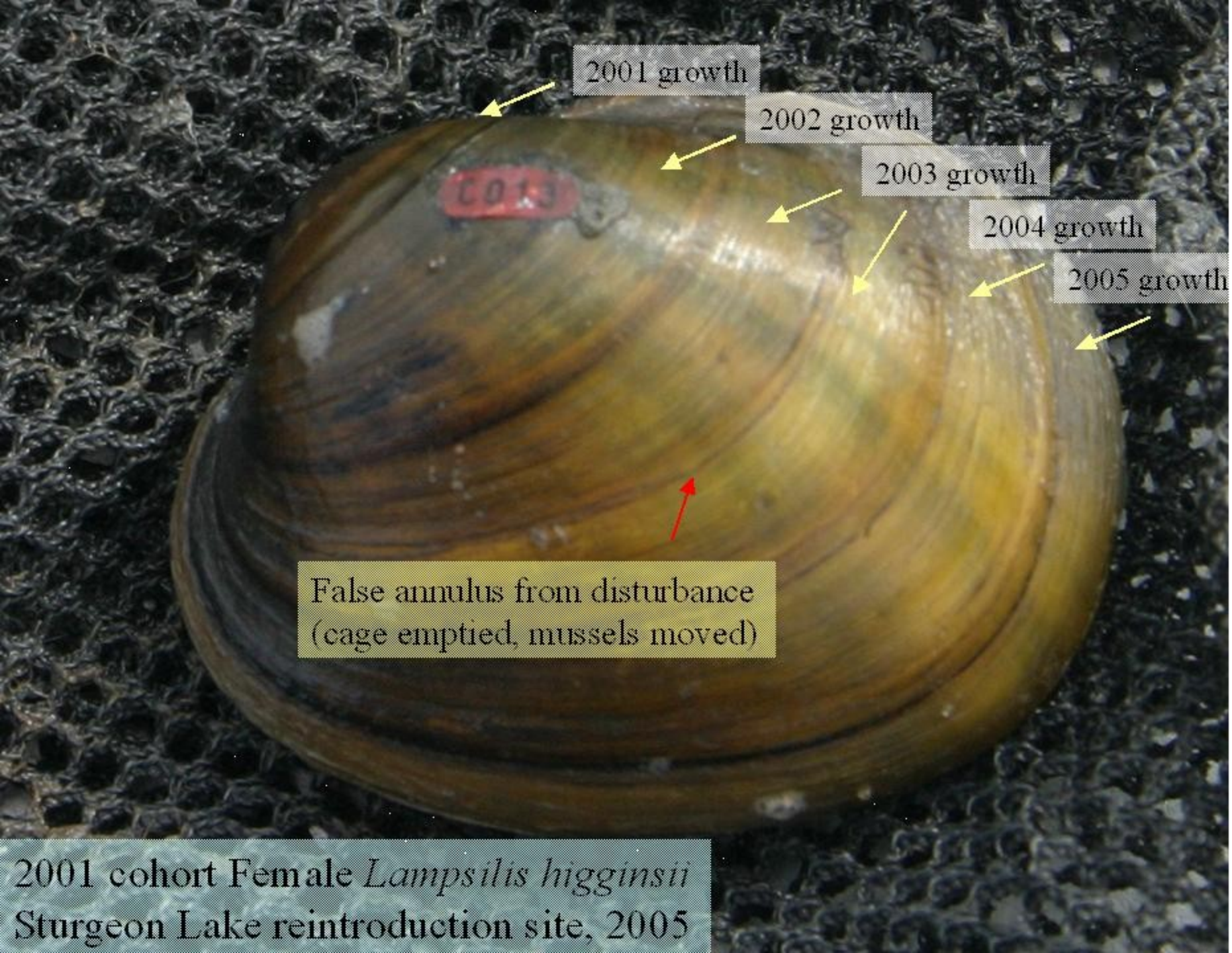
Marking subadult Higgins eye prior to stocking

2. Stocking Sub-adults

Methods

- 1. Grow Juveniles in "Closed" Cages Until Age 2 or 3 and Release into River
  - 9,754 stocked at six sites **+ 19,135 in 2007 = 28,889 total**
  - Age 1, 10 – 20 mm; Age 2, 20 – 40 mm; Age 3, 40 – 50 mm
  - Survival influenced by predation (fish?)
  - Sexually mature in four years (same as in cages)
  - Three color phases (red – green – yellow)
  - 13 other species found in cages

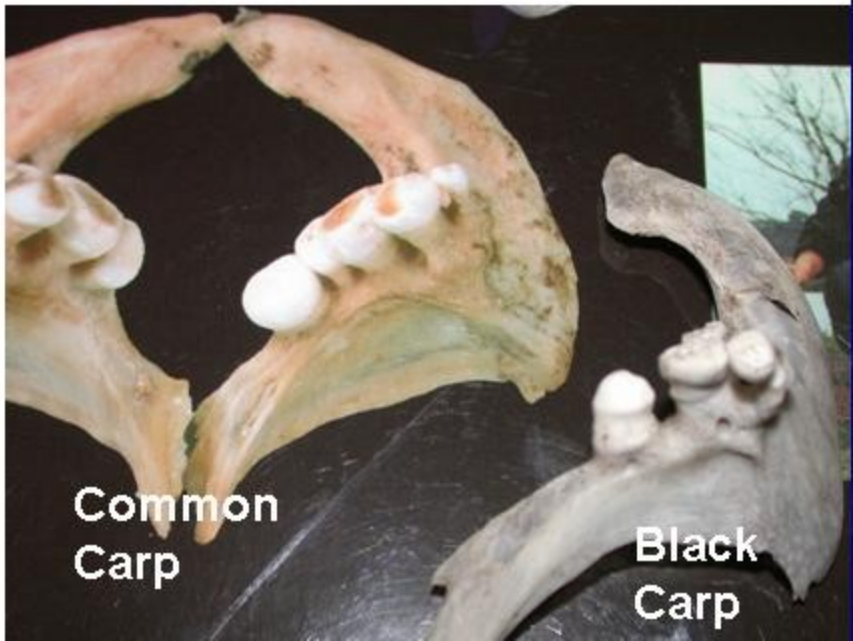

Site 1
St. Paul
Mpls.
LD 1
Pool 2
St. Croix R.
Site 2.
Minnesota R.
Site 3
LD 2
Pool 3
Site 4
Twin Cities Metro Area
UMR's Last Native Mussel
Refuge from Zeebs?
LD 3
Pool 4
Lake Pepin



2001 cohort Female *Lampsilis higginsii*
Sturgeon Lake reintroduction site, 2005

Subadults protected under wire blanket

Unprotected subadults


Common
Carp
Black
Carp

Higgins eye

Lampsilis higginsii

Color phases

3. Stocking Adults

Methods

- 1. Clean Adults of Zebra Mussels and Relocate
  - 472 adults relocated from Pools 11 and 14 to Pools 2 and 3 **+ 2,100 state-listed species**
  - High Survival (only found 8 dead), -1 to 19 mm growth
  - Gravid females

Cleaning Higgins eye of zebra mussels and preparing for transport

Cordova, IL

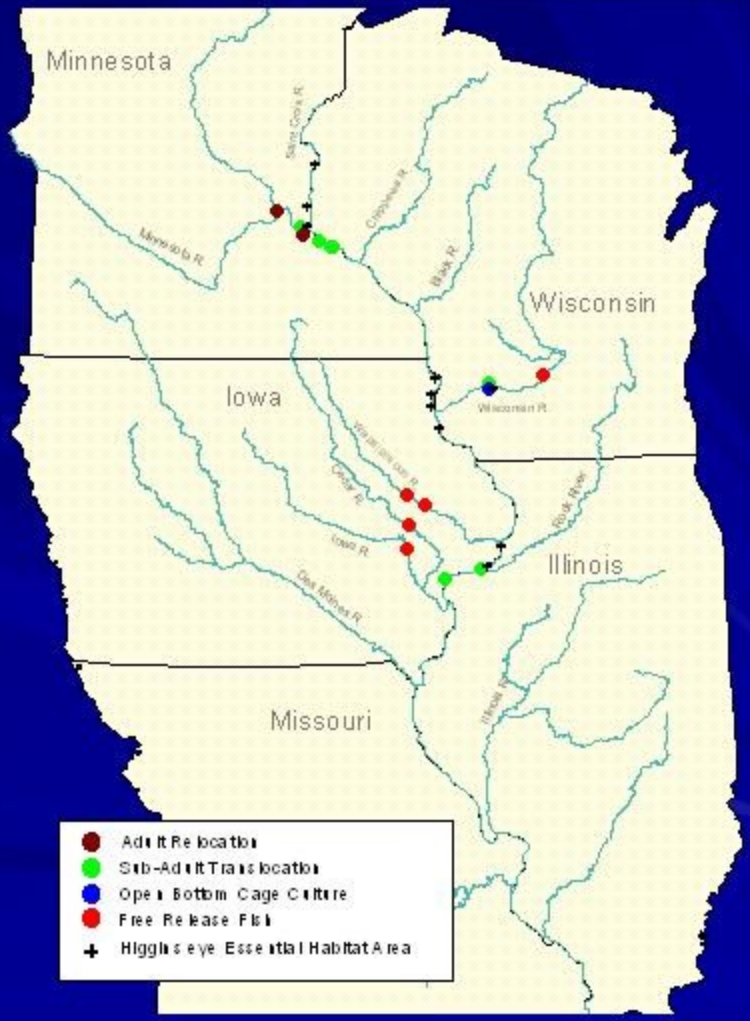
Pool 14, Upper Miss. River

Transport and placement of Higgins eye from Pool 14 at Cordova, IL to Pool 2, Twin Cities, MN

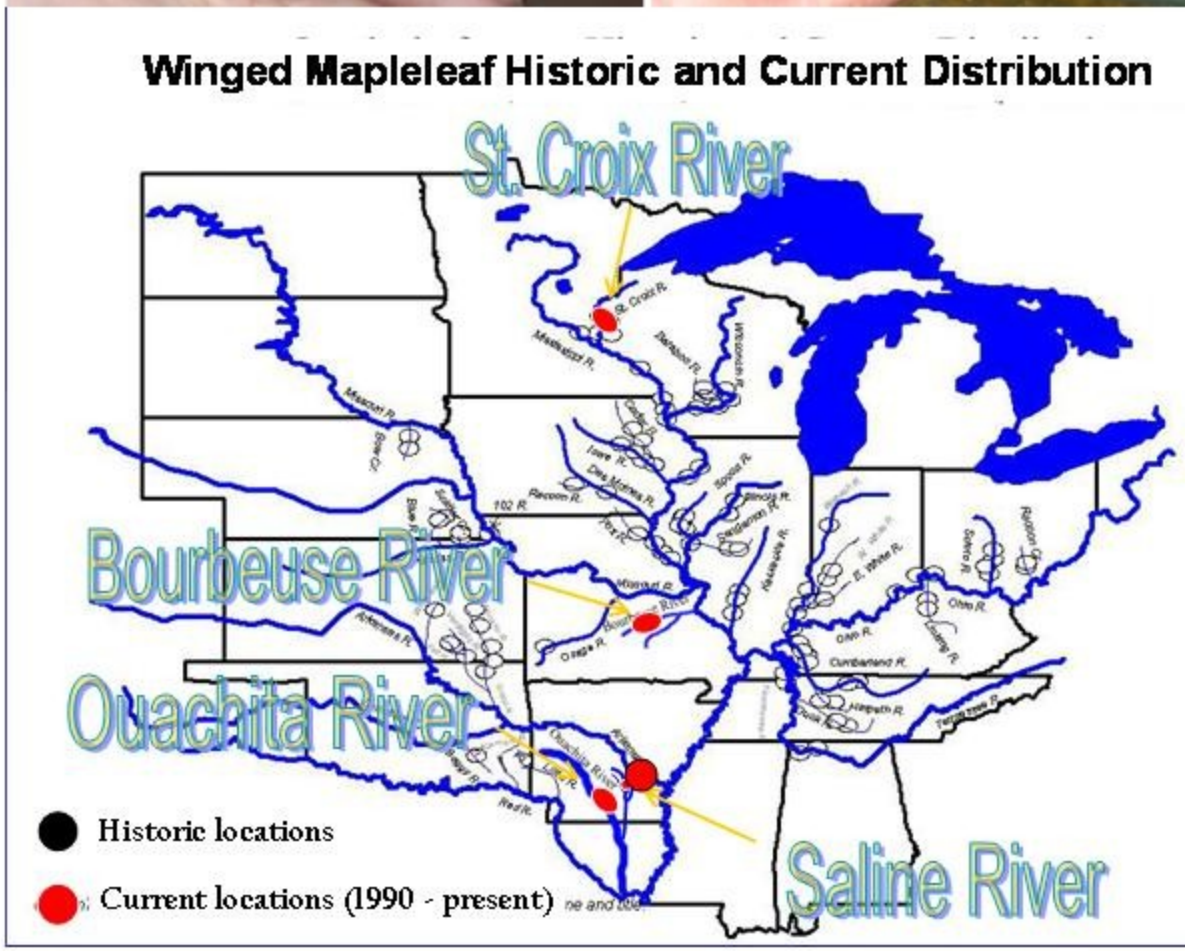
Gravid female Higgins eye

Mid Point of Ten Year Establishment Period – What Next?

- Propagation through 2008, augmentation thereafter.
- Survey for Higgins eye recruits
- Continue to monitor sub-adults
  - Survival, growth, etc..
  - Evaluate protection and rearing technique
- Develop and implement long term monitoring strategy (20 years)
  - Viable populations?
- Develop mussel database



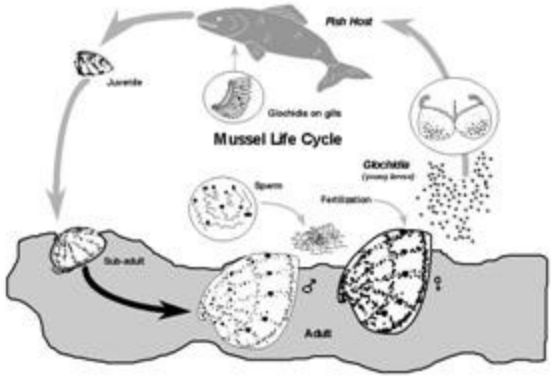
Federally Endangered Winged Mapleleaf (*Quadrula fragosa*)

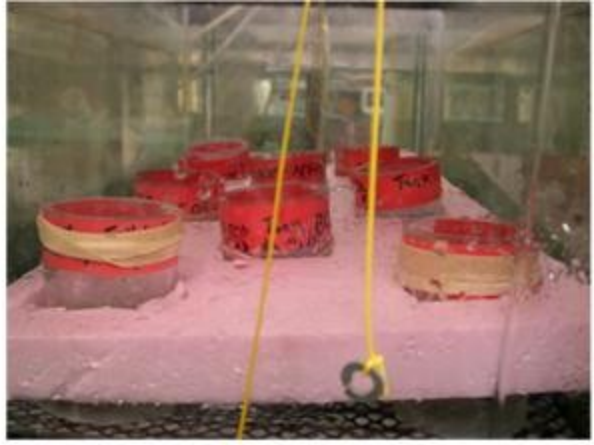


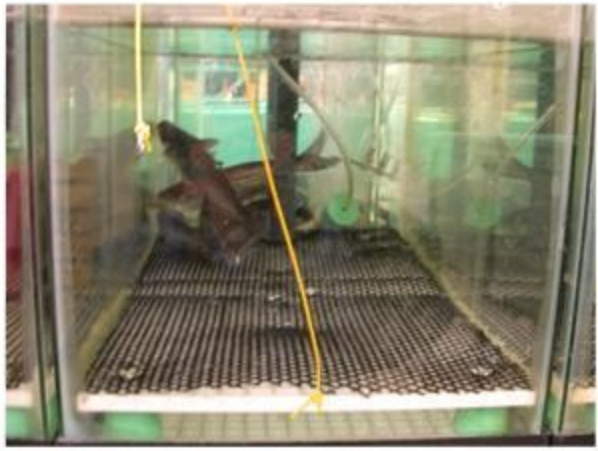
2005 estimated population of WML at single collection site in Saline River, AR = 10,000

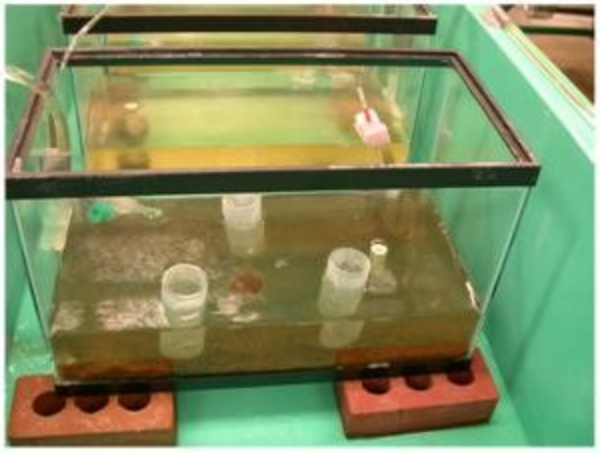
2004

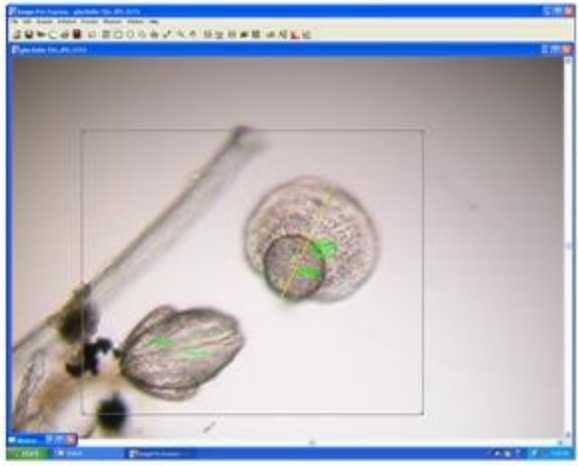
Host fish for WML found to be blue catfish and channel catfish











2005 Cohort

6 cages at Hudson

24 juveniles collected 2006; 100% survival 2007

Zebra mussels attached 2006 & 2007

2006 Cohort

5 cages at Hudson = 3

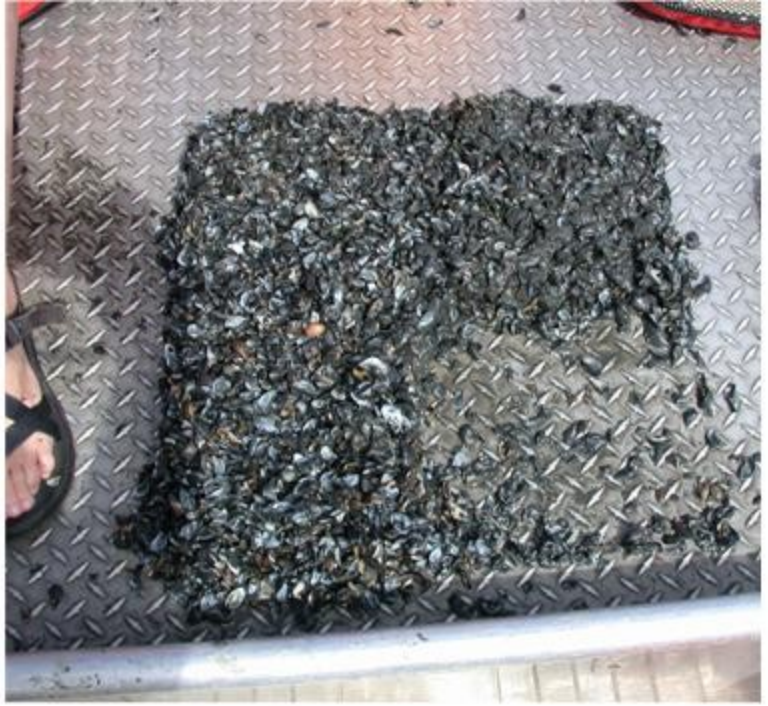
4 cages at Frontenac = 0 juveniles recovered in 2007

Zebra mussels at both sites

2007 Cohort

Assuming 0 juveniles due to zebra mussels

Winged Mapleleaf
2005 Cohort
collected 10/1/07



2005

East Channel

Prairie du Chien, WI

Pool 10, Upper Miss. River

2000 – 2006

Zebra mussels at cage propagation site Frontenac, MN

Pool 4, Upper Miss. River

F

Sept. 17, 2007

Frontenac, MN

Pool 4, UMR

Time to Look for Another Propagation Site !

On-going MCT Activities

- April 2000 Biological Opinion (*Lh & Qf*)
- Host fish ID & propagation of other species
- Pool-wide population estimates
- Life history research & modeling
- Standard mussel sampling protocol for large and small scale projects
- New GIS database
- Maintaining UMRS Mussel Web Site
- Proposal to include mussel conservation in Navigation & Ecosystem Sustainability Program (NESP)

Brought to you by –

A dedicated bunch of River Rats !

NPS (Byron, Bob, Lisel, Brenda, Jennifer)

Mark Hove, U of M

Bernard Sietman, MDNR

Nick Rowse, Susan Oetker, Phil Delphey, FWS